

PATENT SPECIFICATION

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(54) IMPROVEMENTS IN OR RELATING TO A SHELTER FOR LIVESTOCK

(71) We, VEB KOMBINAT IMPULSA, of 7904 Elsterwerda, East Germany, a corporation organised under the laws of East Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to a shelter for keeping large numbers of cattle on a limited area, and in which the equipment for automatic feeding, milking and removal of the animal excretions preferably each form a respective unit.

Several solutions are known for the maintenance of large numbers of dairy cattle. Almost all these solutions refer to accommodation of the cows at ground level, whereby several sheds are co-ordinated to and connected in various ways with each other, or the cows are kept in a compact building. In these solutions, the milking plant is positioned in the centre of the sheds in a separate building, or at the circumference of the compact building. These solutions have the disadvantage that, owing to the arrangement at ground level, large areas of agricultural ground are lost. Furthermore, long distances have to be travelled within the plant by stationary and mobile means of transport for conveying fodder, milk and liquid manure. This transport equipment involves, in addition to high initial costs, considerable expense for repairs. Also the energy requirements, naturally, increase with the size of the transport unit. Furthermore, the use of milking stalls or of conveyORIZED milking plants make it necessary to drive the cows for long distances. In a known milking plant, the cows pass across a turntable to stalls arranged in fan shape. The stall can be opened and closed from a control desk. During milking, the milker in his cabin moves past the stationary milking stalls.

Automatic fodder supply can also be initiated from the cabin. Also multi-storied build-

ings are known for fattening cattle, with plane stories and rectangular or circular cross-section. This has the disadvantage that a transport plant sectionalized into stories is required which involves larger investment and higher maintenance costs. Another problem is the removal of manure, because with this solution, there is not sufficient natural slope, and mechanical means are required to remove the dung. It is known to shift the dung into the liquid manure gutter by means of scrapers or on short conveyor belts positioned below the stalls, whereby removal and cleaning of the conveyor belt is assisted by additional jets. Spray jets incorporated in the liquid manure gutters are also known, which, however, have to have a high water consumption to be effective.

A known arrangement for keeping large numbers of dairy cattle consists of placing the cows permanently in individual stalls and to convey them from one tending station to the next. During rest periods for the cattle, the stalls are moved through a darkened room. This enables mechanization or automation of the tending of the cows and of the milking and feeding operations, it is, however, a disadvantage that it requires an expensive transport plant, that the plant extends over a large area, and that, consequently, it is not suitable for large dairy livestock, owing to its surface extent and to its high technical requirements. The necessary extensive area causes considerable difficulties for automation and subsequent data processing.

According to the present invention, there is provided a livestock shelter comprising a plurality of stalls disposed in a helical array, advancing about a vertical axis, a plurality of displaceable carrier members, helical guide means extending along a path substantially parallel to the array, each carrier member being individually displaceable along the guide means and carrying equipment for servicing livestock located in the stalls.

Preferably, the shelter comprises a cylindri-

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cal structure which is provided with several parallel stands for the cows. The stands are arranged in form of a helix extending from the bottom to the top of the cylindrical shelter.

5 Each stand is provided with a plurality of separate stalls, each of which may be provided with an automatic, preferably pneumatic device, forcing the cow before milking into a certain position and holding her there during milking.

10 Advantageously, several beams, which carry the necessary feeding-, milking- and washing equipment for tending the animals, are supported between two spiral guides which are disposed around the outer circumference of a central column and the inner surface of the circular outer wall of the shelter, respectively.

15 The ends of the beams are supported on the spiral guide members and may be so displaced as to cause the beams to rotate relative to a central column.

For the removal of the animal excretions, helical gutters are arranged below the stalls. Owing to their arrangement, the gutters have a uniform and adequate slope. The gutters may be cleansed by being rinsed at intervals with varying volumes of liquid.

20 The liquid flush carries away the dung, urine, remains of fodder and other dirt which may be present in the gutter. The edge of the gutter protrudes above the level of the floor of the stalls, causing the water surge to clean also the stalls. A storage tank for reclaimed rinse liquid is placed on the roof of the building. This tank is provided with a control valve which, on being opened, permits the tank to be suddenly drained, causing a surge wave which breaks off dung and other dirt, lodged in the manure gutter. The dislodged dung and other waste products pass into a closed pit or sump which is located below the building. Sediment is removed from the sump for further processing. The clarified rinsing liquid is continuously evacuated from below the liquid level in the sump, is rendered odourless and then returned to the storage tank for re-use.

An embodiment of the invention will now be more particularly described with reference to the accompanying drawings, in which:—

50 Fig. 1 shows a cross-section of a shelter embodying the invention;

Fig. 2 shows a plan view of Fig. 1;

55 Fig. 3 shows a segmental portion of Fig. 2 on an enlarged scale, and shows the arrangement of some of the stalls for the dairy cattle;

Fig. 4 shows a scrap-section of Fig. 1, and shows details of the construction of the manure removal plant;

60 Fig. 5 shows an elevational view of the washing- and drying plant;

Fig. 6 shows a plan view of Fig. 5.

The shelter shown in Fig. 1 comprises a cylindrical structure which is provided with a roof 2 supported on an outer circular wall 1.

A central column 7 stands on a foundation 3 and supports the inner ends of a plurality of carrier beams 4, 5, and 6. The ends of the beams 4, 5, and 6 are slidably mounted on helical guides. The guide which supports the inner ends of the beams 4, 5, and 6 extends around the outer surface of the central column 7 and that which supports the outer ends of the beams extends around the inner surface of the outer wall 1 of the cylindrical structure.

70 The inner and outer guides have the same gradient and maintain the carrier beams horizontal. From the beam 4 are suspended brackets 4a which are provided with horizontal arms 4b. As shown in Fig. 2, the arms 4b are arranged to form three segments of a circular ring which define a trapezoidal outline. Automatic milking units are mounted on the arms 4b and, owing to the segment arrangement, serve more cows at the circumference than at the centre portion of the annular stall area.

Cattle spraying- and drying units 5a and 5b (see Fig. 5) are suspended from the carrier beam 5. The units serve for cleaning and drying of the cows and, as a rule, precede the beam 4 in the operational cycle.

The cattle stalls are arranged as shown in Fig. 2 in a plurality of concentric helical arrays 9, 10, 11 and 12. As indicated in the drawings, when the beam 4 is displaced along its guides, the beam 4 moves above the stalls, the bracket 4a move between the concentric arrays of stalls, and the arms 4b carrying the milking machine moves below the stalls arranged in the concentric arrays 9, 10, 11 and 12. The orifices of the spray-jet and drying units 5a and 5b are so arranged as indicated in Figs. 5 and 6 that some are located above, some between, and some below each array of stalls, to enable cleaning of the entire body of the animal. The spraying and drying units 5a and 5b are traversed round each array of stalls as the beam 4 is slidably displaced along its guides, the direction of movement of the spraying and drying unit is indicated in Fig. 6 by an arrow 36. As shown in Fig. 3, every helical array of stalls 9, 10, 11 and 12 is provided with several stall spaces 9a, 10a, 11a and 12a corresponding to the size of the cow to be accommodated therein. The floor portion of each stall is provided with an aperture 13 which is located below the udder of the cow housed in the respective stall. The apertures 13 are each provided with closure means which may be operated to close the respective aperture.

115 Each stall is provided with a guide rail 14 which may be displaced by an hydraulic or pneumatic ram 15 comprising a cylinder and co-operating piston. The guide rail 14 may be displaced to force the cow into the correct position in her stall before applying the milking tackle.

As indicated in Fig. 2, the cows in the stalls 10a of the array of stalls 10 are oriented so as to face those in the stalls 11a of the

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array of stalls 11. Intermediate these arrays of stalls, an annular trough system is arranged. These annular troughs, and others adjacent the stalls 9a and 12a, are supplied with fodder and drinking water from discharge shutes carried by the beam 6. The fodder is fed to troughs by means of fodder dispensing apparatus carried by the carrier member 6 and is derived from tier silos 29, see Fig. 1, which are located at the circumference of the cylindrical shelter.

Fig. 4 shows an arrangement for removing manure and other waste from the stalls. The manure removal unit comprises a storage tank 16, which may be mounted on the roof of the stable building. The storage tank 16 is supplied with water derived from a sump 17 via a pump 18 and a pipe 19. Sediment in the sump 17 may be removed for further processing by a sludge pump 20. The water stored in the storage tank 16 is supplied at intervals and in bursts to helical manure gutters 21 which, as indicated in Fig. 4, are located below the stalls. The slope of each of the manure gutters 21 is such that the rush of water down the gutters effectively flushes the animal excreta away and carries them down to the sump 17. It has been found that this flushing action is generally so effective that mechanical scrapers are not necessary. The manure gutters are so shaped that the water surge also floods the floors of the stalls and cleans them. The flushing water collects in the sump 17 and after suitable purification, may be re-circulated.

As shown, the stalls in adjacent parallel paths are oppositely inclined to the radial direction to define a herring-bone pattern.

WHAT WE CLAIM IS:—

1. A livestock shelter comprising a plurality of stalls disposed in a helical array, advancing about a vertical axis, a plurality of displaceable carrier members, helical guide means extending along a path substantially parallel to the array, each carrier member being individually displaceable along the guide means and carrying equipment for servicing livestock located in the stalls.

2. A shelter as claimed in claim 1, wherein the stalls are arranged to extend along a plurality of concentric parallel paths, each stall being elongated in a direction inclined to the radial direction of the helix.

3. A shelter as claimed in claim 2, wherein the stalls in adjacent parallel paths are oppositely inclined to the radial direction to define a herring-bone pattern.

4. A shelter as claimed in any one of the preceding claims, wherein the guide means comprises an inner guide member provided on a column co-axial with the array and an outer guide member concentric with and parallel to the inner guide member, and wherein each carrier member extends radially with respect to the array between the inner and outer members.

5. A shelter as claimed in any one of the preceding claims, comprising at least one helical gutter extending parallel to and disposed below the stalls for conveying manure therefrom.

6. A shelter as claimed in claim 5, comprising a rinsing liquid storage tank connectable to the or each gutter for supplying rinsing liquid thereto, a sump for receiving manure and rinsing liquid from the or each gutter, and means for re-circulating the rinsing liquid from the sump to the storage tank.

7. A shelter as claimed in any one of the preceding claims, wherein on at least one of said carrier members the equipment for servicing the livestock comprises apparatus for dispensing fodder to the livestock.

8. A shelter as claimed in claim 7, comprising at least one tier silo arranged adjacent the circumference of the shelter for supplying fodder to the fodder dispensing apparatus.

9. A shelter as claimed in any one of the preceding claims, wherein on at least one of said carrier members the equipment for servicing the livestock comprises apparatus for cleaning and drying the livestock.

10. A shelter as claimed in any one of the preceding claims, wherein on at least one of said carrier members the equipment for servicing the livestock comprises apparatus for extracting milk from the livestock.

11. A shelter as claimed in claim 10, wherein the milk extracting apparatus is carried on plurality of brackets depending from the respective carrier member.

12. A shelter as claimed in any one of the preceding claims, wherein the shelter comprises a helical stand disposed below the stalls and supporting the or each gutter.

13. A livestock shelter substantially as hereinbefore described with reference to the accompanying drawings.

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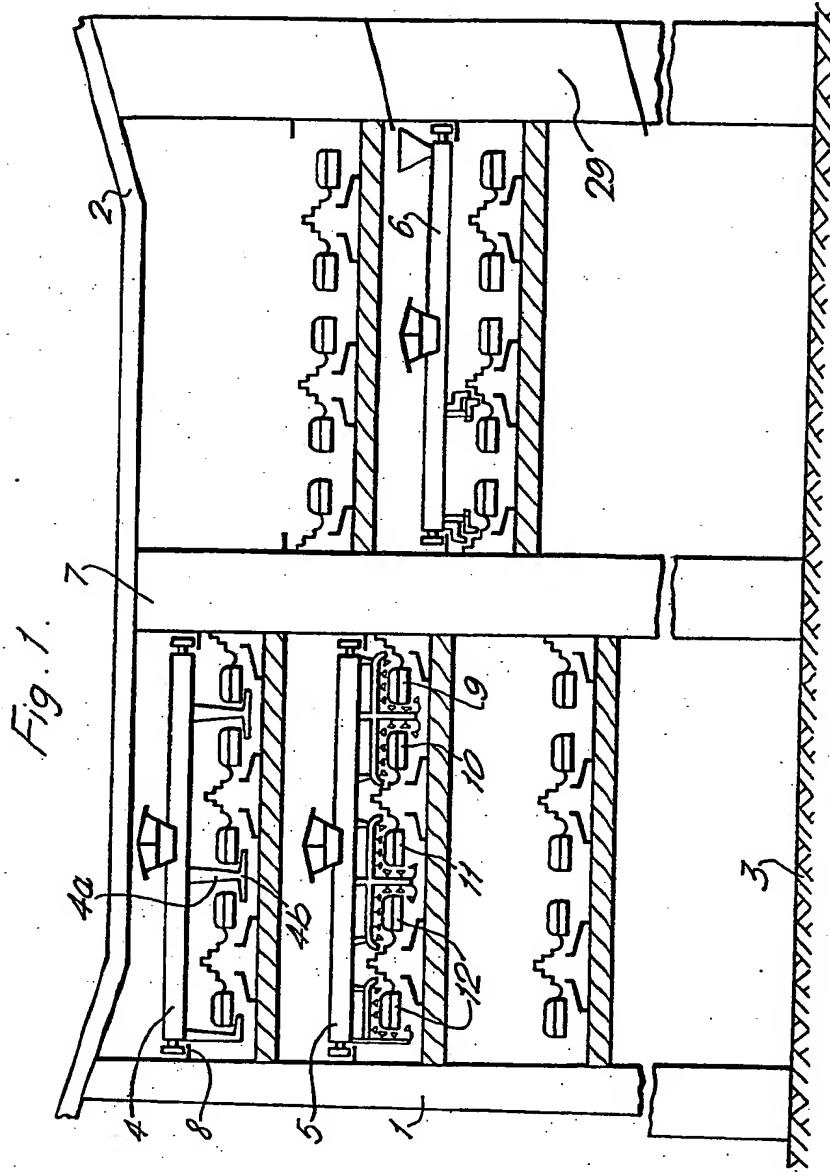
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COMPLETE SPECIFICATION

5 SHEETS

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Sheet 1



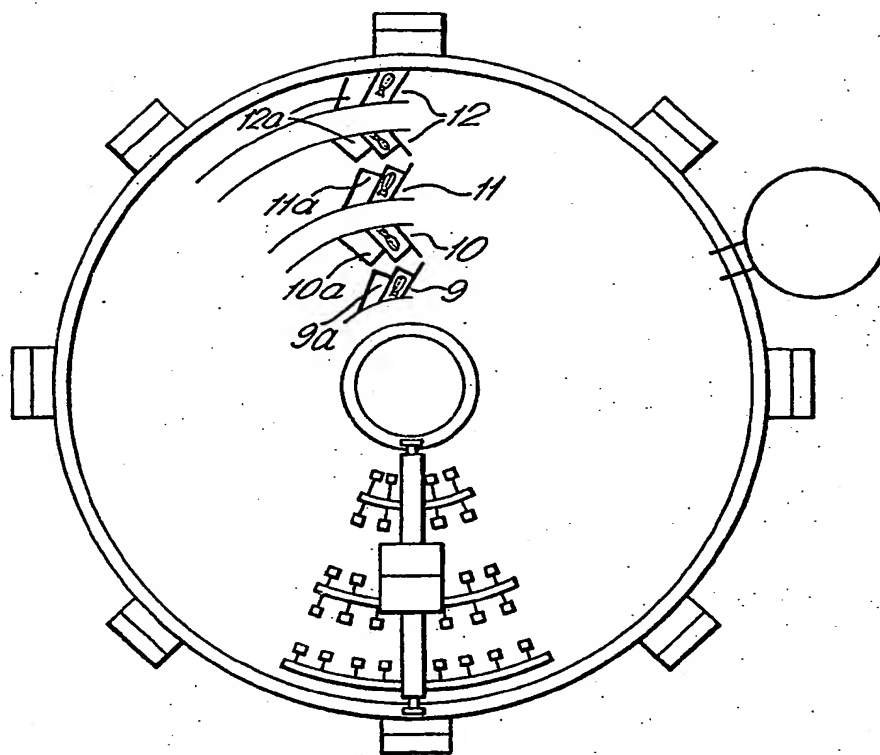
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Sheet 2

Fig. 2.



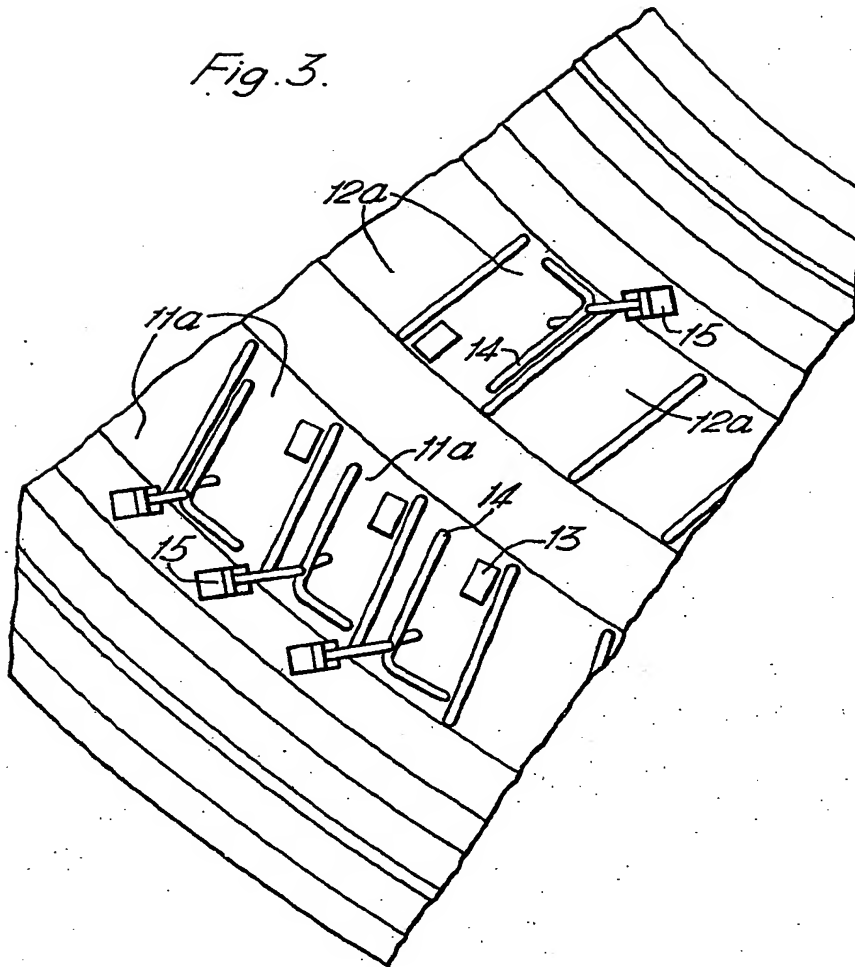
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Fig. 3.



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